

Human Error and Performance

‘human nature is the problem and “controls”
are needed to reduce the chances for error’

by Peter Ingrassia *

*The speaker is not a subject matter expert—
But he did stay at a Holiday Inn® last night!

- The material comes from the “Human Performance course reference”, distributed by the Institute for Nuclear (Nook-u-lur) Power Operations (INPO)
- This presentation ignores the Safety Implications of Human Performance and concentrates only on “operations”

Background

- Each year, Human Error makes (or is close to making) the “*Top 10*” failure list.
 - Run4 14th 19.8 hr v. 135 hr for 1st place
 - Run5 5th 35.2 hr v. 69 hr for 1st place
 - Run6 6th 29.9 hr v. 65 hr for 1st place
- It is probably true that Human Error has always been a contributing factor to failure and only recently have we become more aware – resulting in increased culpability.

Examples – We all are included

- After a quench an Operator ramps magnet power supplies prior to getting the “green light to ramp” from CRYO.
- Experimenter loses the “sweep” during remote controlled access (@ STAR/Phenix = 0.5hr)
- During a planned “reset” of multiple front end computers – fecs that should not be reset are reset.

Error Modes -1

- Skill Based Performance
 - Highly practiced actions in very familiar situations
 - E.g. Logging, hanging a tag, performing repetitive calculations
- Error Mode -- inattention

Error Modes -- 2

- Rule Based Performance
 - Based on the selection of mentally stored rules derived from one's recognition of a work situation. (rule interpretation)
 - E.g. Deciding whether to replace a bearing during preventative maintenance, responding to an alarm.
- Error Mode -- misinterpretation

Error Modes -- 3

- Knowledge Based Performance
 - A response to an unfamiliar situation. Person relies on his/her knowledge or understanding of the system.
 - E.g. troubleshooting, engineering evaluation, resolving human performance problems.
- Error Mode -- an inaccurate mental model of the system, process, or plant status

Error Prevention

- Errors are prevented or caught by
 - Machines (“do you really want to delete this file?”)
 - Other People (peer checking, administrative control, etc)
 - Individuals (self-checking)
 - Least reliable of the three methods

Error Prevention -- Techniques

- From a Fall 2002 survey of Commercial Reactor Operators (in order of popularity)
 - Self Checking
 - Peer Checking
 - Three-point communication
 - Procedure Use and Adherence
 - Pre-job Briefings*
 - Stop when Unsure* (**TIME OUT**)
 - Questioning Attitude*
 - Place keeping

Techniques - 1

- Prejob Briefing
 - Prepare worker for what is to be accomplished
 - Sensitize worker to what is to be avoided
 - Briefing is a dialog – not a monologue
 - Briefings for routine as well as complex tasks

Techniques -- 2

- Stop When Unsure
 - For collaboration to occur people must recognize that they are in a knowledge based situation – a situation where their mental model may be incomplete.
 - When a question arises and the solution is uncertain, stop and get help from those who have expertise.

Techniques -- 3

- Questioning Attitude
 - Fosters awareness of uncertainty
 - Encourages foresight (understanding of near term actions and possible outcomes)

Techniques -- 4

- Concurrent (Double) Verification
 - Second qualified individual verifies correctness of an action and the expected result before and during the action
 - For complex activities that have a direct negative impact on plant reliability
 - Like Peer Checking it is used to catch errors BEFORE they are made.

Techniques -- 5

- Independent Verification
 - A second qualified individual, operating independently after the original performance, checks to see that the desired condition exists.
 - Technique uncovers errors after they are made

Techniques -- 6

- Problem Solving
 - Chances for error increase in knowledge based situations
 - Without guidance, people do not solve problems rigorously, methodically, or painstakingly (wrong audience for this statement).
 - People will default to what they are comfortable with – trial and error.
- Problem solvers are an asset to the organization

Techniques -- 7

- Operating Experience
 - The key to using operating experience is to communicate the right information, to the right people, at the time when it is needed to make a difference.
 - It is unreasonable to expect workers to recall lessons from training provided months or years earlier
- WEB based “tools” / “how to”, etc.
 - WEB Availability throughout the complex?

Techniques – 8

- Supervisory Monitoring
 - Supervisor presence in the workplace can be an effective defense against error.
 - Supervisors, when they detect at risk practices or behaviors that do not satisfy expectations and performance standards, can coach, reinforce, and counsel as needed. They can solicit feedback. Communication with workers should promote a spirit of cooperation, mutual respect, honesty, and fairness.
- Maintenance Days

Team Errors --1

- **SOCIAL LOAFING** – because individuals are usually not held personally accountable for a group's performance, some individuals may not actively participate. People refrain from becoming involved believing that they can avoid accountability or “loaf” in team or “social” activities.

Team Errors -- Contributing Factors-- 1

- Halo Effect
 - Blind trust in the competence of specific individuals because of their experience or position in an organization.
- Pilot/Co-pilot
 - A subordinate (co-pilot) is reluctant to challenge the opinions, decisions, or actions of a senior person (pilot)

Team Errors – Contributing Factors -- 2

- Free Ride
 - If one person takes the lead in a group activity, the others may tag along without actively scrutinizing the intent or actions of the one doing the work
- Groupthink
 - The reluctance to share contradictory information for the sake of maintaining harmony in the work group. Too much “professional courtesy”. Sugar-coating bad news so as to not displease managers

Team Errors – Contributing Factors -- 3

- Risky Shift
 - Tendency to gamble with decisions more as a group than if each member was making the decision individually. Accountability is diffused in a group. Two or more people may agree that they have a “better way” and they may take the risk and disregard established procedure or policy

Antidotes to Team Error

- Train on Team errors
- Practice Questioning Attitude
- Designate Devil's advocate
- Maintain independent thought amongst team members
- Challenge actions and decisions of others
- Call “time outs” to help the team achieve shared understanding of plant or product status

Conclusions – stolen words of wisdom

- The *will* to communicate and the means to communicate must prevail in the organization. Assertive communication is essential to effective execution of some error-prevention methods.

Conclusions – more stolen words of wisdom

- Some people may be insulted when others check their work. When people are directed to check or review another person's performance, the competence of the performer is not being called into question. Controls are necessary because of human fallibility, not incompetence

Conclusions – even more stolen words of wisdom

- Humans are fallible, and even the best people can make the worst mistakes. Regardless of who a person is and what position he or she holds in an organization, that person can err. Therefore, controls (defenses and error prevention techniques) are adopted to prevent, catch, or mitigate outcomes of error. The purpose of these controls is to make the process/task go smoothly, properly and according to standards. Remember, ‘positive control means that what is intended to happen is what happens, and that is all that happens’.